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DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service

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National Institute for Occupational Safety and Health
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HETA 2002-0079

Mr. Sam Pulcrano
Manager
Safety Performance Management
United States Postal Service
Room 9801
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Washington, D.C. 20260-4231

Dear Mr. Pulcrano:

On December 14, 2001, the National Institute for Occupational Safety and Health (NIOSH) received a request from management officials at the United States Postal Service (USPS) related to handling and sorting irradiated mail at the "V" Street warehouse and Brentwood Postal Tent Facilities (located in the parking lot at the Brentwood facility) in Washington, D.C. USPS employees at the "V" Street facility expressed concerns about symptoms such as headache, eye irritation, lightheadedness, nose irritation, chest and throat tightness, and nausea when processing irradiated mail. This letter summarizes the results of our investigation and offers recommendations to help control and reduce symptomatology.

Introduction

Prior to the investigation, we were informed by USPS management that an industrial hygiene (IH) consultant had detected elevated levels of carbon monoxide (CO) and volatile organic compounds (VOCs) when boxes of mail were unloaded from trucks and opened. Another possible contaminant that was a concern was ozone (O_3), a byproduct of the irradiation process. O_3 can be found around sources of X-rays and ultraviolet rays, electrical arcs, mercury vapor lamps, and electrical discharges in general.[1]

We visited the facilities from December 18-19, 2001. On December 18, an opening conference was held with USPS representatives, the USPS IH consultant, and NIOSH representatives during which information was obtained on the mail handling procedures and the facilities where the mail is handled and sorted. After the opening conference, air samples were collected at the "V" Street facility for VOCs, CO, O_3, and chlorine (Cl_2) [Cl_2 is found in cleaning solutions, and may be found in the mail processing facilities as a result of cleaning or disinfecting]. Area and personal air samples were collected throughout the building where workers handle and sort the mail. On December 19, an evaluation was conducted at the Brentwood Postal Tent Facility, where the mail is delivered from the irradiation process and "aired out" prior to being placed into the mail delivery system.

In addition to the environmental assessment, we conducted confidential medical interviews with employees to assess health concerns potentially related to the handling of irradiated mail. A closing conference was held at the "V" Street facility on December 19, during which preliminary findings and recommendations related to both facilities were discussed. During the time of our evaluation, there were approximately 120 contract employees at the Brentwood Postal Tent Facility and approximately 140 postal employees working at the "V" Street facility.

Background

After the mail irradiation process began (as a result of addressing the threat of biological agents being sent in the mail), workers receiving irradiated mail at the "V" Street facility began reporting symptoms such as headache, eye irritation, lightheadedness, nose irritation, chest and throat tightness, and nausea. In response, the USPS hired an industrial hygienist in early December to evaluate the work area and determine if there was a work place exposure responsible for the symptoms described by the "V" Street employees. Results of these evaluations indicated that elevated levels of CO and VOCs were present. In response to the results received in early December, the USPS changed the irradiated mail handling procedures to "air the mail out" before delivery to "V" Street. The irradiated mail was delivered from the irradiation facility to tents located in the parking lot at the Brentwood Postal Tent Facility, then delivered to the "V" Street facility. This was the process in place during the time of our evaluation (December 18-19, 2001).

At the Brentwood Postal Tent Facility, boxes of mail were unloaded from trailers and placed inside a tent, where they were opened and the plastic bags of mail in the boxes were removed. The bags were placed in front of a temporary ventilation hood (located in the tent) and were opened, and the mail was removed. The temporary hood exhausted to the outside, where captured contaminants would be diluted in the ambient environment. At the time of our evaluation, mail in the trays was sprayed with a deodorizer to remove the odor associated with the mail. The mail trays were placed in the tent to off-gas any contaminants prior to being transported to the "V" Street facility.

Industrial Hygiene Methods

Air samples for CO, CO_2, VOCs, O_3, and Cl_2, were collected at the Brentwood Postal Tent Facility and the "V" Street facility while irradiated mail was handled and processed.

Carbon Monoxide (CO)

Personal breathing zone (PBZ) and area CO concentrations were measured using real-time ToxiUltra Atmospheric Monitors (Biometrics, Inc.) with CO sensors. These monitors are direct-reading instruments with data logging capabilities. The instruments were operated in the passive

diffusion mode, with a 30-second sampling interval, and a nominal range from 0 parts of CO per million parts of air (ppm) to 999 ppm.

Additional CO air samples were collected using Mine Safety and Health Administration (MSHA) 50–milliliter (mL) glass evacuated containers. These instantaneous "Grab" samples were collected by snapping open the top of the evacuated glass container and allowing the air to enter. The containers were sealed with wax–impregnated MSHA caps. The samples were sent by overnight delivery to the MSHA laboratory in Pittsburgh, Pennsylvania, where they were analyzed for CO using a Hewlett-Packard 6890 gas chromatograph equipped with dual columns (molecular sieve and porapak) and thermal conductivity detectors.

Volatile Organic Compounds (VOCs)

Thermal Desorption Tubes

PBZ and area air samples were collected on thermal desorption tubes during mail handling activities to identify VOCs. The thermal desorption tubes were attached by Tygon® tubing to sampling pumps calibrated at a flow rate of 50 cubic centimeters per minute (cc/min). Each thermal desorption tube contained three beds of sorbent material: a front layer of Carbopack Y™, a middle layer of Carbopack B™, and a back layer of Carboxen 1003™. The thermal desorption tubes were analyzed by the NIOSH laboratory using stainless steel tubes configured for thermal desorption in a Perkin–Elmer ATD 400 automatic thermal desorption system and analyzed using a gas chromatograph with a mass selective detector.

Charcoal Tubes

PBZ and area air samples were also collected during mail handling activities on charcoal tubes. The charcoal tubes were attached by Tygon® tubing to sampling pumps calibrated at a flow rate of 200 cc/min. The charcoal tubes were sent to Datachem Laboratories, Inc. (Salt Lake City, UT) to be quantitatively analyzed for compounds of interest that were identified on the thermal tubes, including acetone, benzene, toluene, perchloroethylene, xylene, and p-dichlorobenzene, using a Hewlett-Packard model 5890A gas chromatograph equipped with a flame ionization detector.

Carbon Dioxide (CO_2)

CO_2 was measured from the "grab" samples collected using the MSHA 50 mL glass evacuated containers.

Ozone (O_3) and Chlorine (Cl_2)

Monitoring for O_3 (detection range of 0.05 to 0.7 ppm) and Cl_2 (detection range of 0.2 to 3 ppm) was conducted with colorimetric detector tubes. The detector tubes are used by drawing air

through the tube with a bellows-type pump. The resulting length of the stain in the tube (produced by a chemical reaction with the sorbent) is proportional to the concentration of the air contaminant.

Medical Methods

The medical officer informally interviewed employees working at the "V" Street facility. Informal interviews were not conducted at the Brentwood facility at the request of the USPS representative because the individuals were all contract employees. Interviews consisted of questions regarding respiratory, neurologic, and dermal symptoms experienced following the initial deliveries of irradiated mail to the facility. Questions were also directed to determine if employees reported any continuing or new symptoms following initiation of the work practice changes. Employees were given the opportunity to ask questions and voice additional concerns. The purpose of the questioning was to understand what employee concerns had triggered the initial investigation by the USPS, if an appropriate medical investigation had been conducted and if the work practice changes initiated resulted in alleviation of reported symptoms. The occupational medicine physician in charge of the "V" Street facility was also interviewed by the medical officer.

Evaluation Criteria

Carbon Monoxide

CO is a colorless, odorless, tasteless gas produced by incomplete burning of carbon-containing materials such as gasoline or propane fuel. The initial symptoms of CO poisoning may include headache, dizziness, drowsiness, or nausea. Symptoms may advance to vomiting, loss of consciousness, and collapse if prolonged or high exposures are encountered. If the exposure level is high, loss of consciousness may occur without other symptoms. Coma or death may occur if high exposures continue.[2,3,4,5,6,7] The display of symptoms varies widely among individuals, and may occur sooner in susceptible individuals such as young or aged people, people with preexisting lung or heart disease, or those living at high altitudes.

Exposure to CO limits the ability of the blood to carry oxygen to the tissues by binding with the hemoglobin to form carboxyhemoglobin (COHb). Blood has an estimated 210-250 times greater affinity for CO than oxygen, thus the presence of CO in the blood can interfere with oxygen uptake and delivery to the body. Once absorbed into the bloodstream, the half-life of bloodborne CO at sea level and standard pressure is approximately five hours. This means that an initial COHb level of 10% could be expected to drop to 5% in five hours, and then 2.5% in another five hours. If oxygen is administered to the exposed person, as happens in emergency treatment, the COHb concentration drops more quickly. Once exposed, the body compensates for the reduced

bloodborne oxygen by increasing cardiac output, thereby increasing blood flow to specific oxygen-demanding organs such as the brain and heart. This ability may be limited by preexisting heart or lung diseases that inhibit increased cardiac output.

The NIOSH recommended exposure level (REL) for CO is 35 ppm for full shift time-weighted average (TWA) exposure, with a ceiling limit of 200 ppm which should never be exceeded.[7] The NIOSH REL of 35 ppm is designed to protect workers from health effects associated with COHb levels in excess of 5%.[2] The American Conference of Governmental Industrial Hygienists (ACGIH®) recommends an eight-hour TWA Threshold Limit Value (TLV®) of 25 ppm based upon limiting shifts in COHb levels to less than 3.5%, thus minimizing adverse neurobehavioral changes such as headache, dizziness, etc, and maintaining cardiovascular exercise capacity.[8] The Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) for CO is 50 ppm for an 8-hour TWA exposure.[9] The US Environmental Protection Agency (EPA) National Ambient Air Quality Standard (NAAQS) for CO requires that ambient air contains no more than 9 ppm CO for an 8-hour TWA, and 35 ppm for a one-hour average.[10] The NAAQS for CO was established to protect "the most sensitive members of the general population" by maintaining increases in carboxyhemoglobin to less than 2.1%.

Carbon Dioxide (CO_2)

CO_2 is a normal constituent of exhaled breath, and if monitored at equilibrium concentrations in a building, may be useful as a screening technique to evaluate whether adequate quantities of fresh air are being introduced into an occupied space. The American National Standards Institute (ANSI)/American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) Standard 62-1989, Ventilation for Acceptable Indoor Air Quality, recommends outdoor air supply rates of 20 cubic feet per minute per person (cfm/person) for office spaces and conference rooms, 15 cfm/person for reception areas, classrooms, libraries, auditoriums, and corridors, and 60 cfm/person for smoking lounges. Maintaining the recommended ASHRAE outdoor air supply rates when the outdoor air is of good quality, and there are no significant indoor emission sources, should provide for acceptable indoor air quality.

CO_2 is not considered a building air pollutant, but CO_2 concentration is used as an indicator of the adequacy of outside air supplied to occupied areas. Indoor CO_2 concentrations are normally higher than the generally constant ambient CO_2 concentration. ASHRAE Standard 62-1989 recommends 1,000 ppm as the upper limit for comfort (odor) reasons.[11] When indoor CO_2 concentrations exceed 800 ppm in areas where the only known source is exhaled breath, inadequate ventilation is suspected.[12] Elevated CO_2 concentrations suggest that other indoor contaminants may also be increased. It is important to note that CO_2 is not an effective indicator of ventilation adequacy if the ventilated area is not occupied at its usual level when the measurements are made. In an industrial setting where there are sources of CO_2 (in addition to exhaled breath) the NIOSH REL, ACGIH TLV, and the OSHA PEL is 5,000 ppm for full shift TWA exposure.[7,8,9]

Volatile Organic Compounds (VOCs)

VOCs are a large class of organic chemicals (i.e., containing carbon) that have a sufficiently high vapor pressure to allow some of the compounds to exist in the gaseous state at room temperature. These compounds could result from heating the mail containing inks and plastics. It is important to note, however, that VOCs are typically found in indoor air environments and are emitted in varying concentrations from numerous indoor sources including, but not limited to, carpeting, fabrics, adhesives, solvents, paints, cleaners, waxes, cigarettes, and combustion sources.

Indoor environmental quality studies have measured wide ranges of VOC concentrations in indoor air as well as differences in the mixtures of chemicals which are present. Research suggests that the irritant potency of these VOC mixtures can vary. While in some instances it may be useful to identify some of the individual chemicals which may be present, the concept of *total volatile organic compounds (TVOC)* has been used to predict certain types of health effects.[13] The use of this TVOC indicator, however, has never been standardized.

Some researchers have compared levels of TVOCs with symptoms such as headache and irritative symptoms of the eyes, nose, and throat. *However, neither NIOSH nor OSHA currently have specific exposure criteria for VOC mixtures in the nonindustrial environment.* Research conducted in Europe suggests that reports of symptoms by building occupants may be more likely to occur when TVOC concentrations increase.[14] It should be emphasized that the highly variable nature of complex VOC mixtures can greatly affect their irritant potential. Considering the difficulty in interpreting TVOC measurements, caution should be used in attempting to associate adverse health effects with specific TVOC concentrations.

Results

Brentwood Postal Tent Facility

Carbon Monoxide (CO)

CO was measured inside the truck that delivered mail to the Brentwood Postal Tent Facility, in the general area inside the tent, and on individual workers processing the mail containers. Table 1 summarizes the results of the CO monitoring using direct reading instruments at the Brentwood Postal Tent Facility.

Table 1. Brentwood Postal Tent Facility CO results [Samples were collected with direct-reading instruments during the unloading of the trailer and irradiated mail handling activities inside the tent].

CO Monitor Location	Sampling Time (min)	Average CO Concentration (ppm)	Peak CO Concentration (ppm)
General area inside Truck Trailer (placed in the middle of the trailer when trailer was full of mail)	98	16	206
Worker inside trailer unloading mail crates	80	2	4
Worker unloading boxes of mail out of metal crates inside tent	159	2	49
Worker opening plastic bags of mail in front of ventilation hood inside tent	53	32	107
General area inside tent	106	3	5

One of the CO monitors was placed inside a bag containing irradiated mail immediately after the bag had been opened. The opened part of the bag was then sealed around the monitor to give an indication of the CO concentration inside the bag. This monitor indicated that the CO concentration inside the bag was greater than 1000 ppm (the upper level of detection for the meter is 1000 ppm).

Two evacuated containers for CO were collected inside two different bags containing irradiated mail at different times during the evaluation. These samples indicated CO concentrations inside bags of 3820 and 460 ppm.

Evacuated container samples were also collected inside the trailer when the mail containers were being unloaded. Two evacuated container samples were collected in the trailer immediately after it was opened for the first time at the Brentwood Postal Tent Facility. These samples indicated CO concentrations of 33 and 38 ppm. Another evacuated container sample was collected in the middle of the trailer when the trailer was approximately half unloaded. This sample did not detect any CO. Another evacuated container sample collected at the front of the trailer (when the trailer was half unloaded) where the mail containers were removed indicated a CO concentration of 1 ppm.

Carbon Dioxide (CO_2)

The evacuated container samples were also analyzed for CO_2. The CO_2 concentrations ranged from 500 to 1500 ppm in the areas inside the truck trailer and tent. These concentrations were well below occupational evaluation criteria (NIOSH and OSHA have assigned a TWA criteria of 5,000 ppm). Two evacuated container samples collected inside bags of irradiated mail indicated CO_2 concentrations of 2400 and 800 ppm.

Volatile Organic Compounds (VOCs)

Individual VOCs were identified with thermal desorption tubes that were analyzed in the laboratory by a gas chromatograph with a mass selective detector. These samples were collected in the general area inside the tent, inside the truck trailer that contained the mail, on the worker who unloaded the trailer, and on workers who processed the mail inside the tent (cutting boxes open and spraying deodorizer on the mail). The results indicated very low concentrations of VOCs. These concentrations are generally in the parts per billion (ppb) range and well below any applicable exposure criteria. Some of the compounds identified on the thermal desorption tubes included toluene, benzene, limonene, 2-butoxyethanol, 2-(2-methoxyethoxy) ethanol, 2-(2-ethoxyethoxy)ethanol, propanol, furan, methyl furan, aliphatic hydrocarbons, perchloroethylene, p-dichlorobenzene, xylene, di-tert-butyl benzene, siloxanes, acetone, and chloroform.

VOC samples were quantified on charcoal tubes for acetone, benzene, toluene, perchloroethylene, xylene, and p-dichlorobenzene. These samples indicated concentrations of acetone less than 0.024 ppm. This concentration is extremely low and is below any applicable exposure criteria. Benzene, p-dichlorobenzene, xylene, toluene, and perchloroethylene were not detected on the charcoal tubes. Minimum detectable concentrations (MDC) were calculated based on the limit of detection for the method and a sample volume of 24 liters. The MDC for the non-detected compounds were 0.003 ppm, 0.005 ppm, 0.0019 ppm, 0.002 ppm, and 0.005 ppm, respectively.

Ozone and Chlorine (Cl_2)

Samples were collected to determine if residual ozone or chlorine was present during mail handling activities. No ozone or chlorine was detected during our evaluation.

"V" Street Facility

Carbon Monoxide (CO)

CO measurements were collected with direct reading instruments inside the truck that delivered the mail to the "V" Street facility and on individual workers inside the building who handled, and sorted the mail. Table 2 summarizes the results of the CO monitoring at the "V" Street facility. CO concentrations were all low and well below applicable exposure criteria.

Table 2. "V" Street Facility CO results [Samples were collected while workers unloaded and processed a trailer of irradiated mail delivered from the Brentwood Postal Tent Facility].

CO Monitor Location	Sampling Time (min)	Average CO Concentration (ppm)	Peak CO Concentration (ppm)
Worker Unloading Truck	60	1.8	3
Worker Sorting Mail	147	1.4	6
Worker Sorting Mail	149	1.2	20
General area inside Truck During Unloading Operations	74	3.1	5

An evacuated container sample collected in the breathing zone of an employee while sorting mail indicated a CO concentration of 1ppm. Another evacuated container sample collected in the general area where the mail is sorted also indicated a concentration of 1 ppm. Two evacuated containers collected in the back of the truck which transported the irradiated mail did not detect CO.

Carbon Dioxide (CO_2)

Two evacuated container samples collected in the sorting area indicated that CO_2 concentrations were 500 ppm. The two evacuated containers collected in the back of the truck which transported the irradiated mail indicated CO_2 concentrations of 800 and 900 ppm.

Volatile Organic Compounds (VOCs)

Individual VOCs were identified with thermal desorption tubes. As with the Brentwood samples, these tubes indicated very low concentrations of VOCs. These concentrations are generally in the parts per billion (ppb) range and well below applicable exposure criteria. Some of the compounds identified on the thermal desorption tubes included toluene, benzene, limonene, 2-butoxyethanol, 2-(2-methoxyethoxy) ethanol, 2-(2-ethoxyethoxy)ethanol, propanol, furan, methyl furan, aliphatic hydrocarbons, perchloroethylene, p-dichlorobenzene, xylene, di-tert-butyl benzene, siloxanes, acetone, and chloroform.

Some VOCs were quantified on charcoal tube samples for acetone, benzene, toluene, perchloroethylene, xylene, and p-dichlorobenzene. These samples indicated acetone concentrations less than 0.35 ppm, and toluene concentrations less than 0.005 ppm. These concentrations are considered extremely low and below any applicable exposure criteria. Benzene (MDC = 0.003 ppm), p-dichlorobenzene (MDC = 0.005 ppm), xylene (MDC = 0.0019 ppm), and perchloroethylene (MDC = 0.005) were not detected on the charcoal tubes.

Ozone and Chlorine (Cl_2)

Samples were collected to determine whether any residual ozone may be in the mail. No ozone was detected during our evaluation. Cl_2 was not detected in the truck which delivered the mail to the "V" Street facility or in the general area inside the building where workers processed the mail. However, a Cl_2 sample collected in the bathroom immediately after it had been cleaned with a chlorine solution indicated a chlorine concentration of 0.3 ppm (NIOSH has a ceiling concentration of 0.5 ppm and OSHA has a ceiling concentration of 1 ppm).

Medical Interviews with Employees

The NIOSH medical officer was available at the "V" Street facility to conduct confidential interviews with employees and to address health concerns they had regarding irradiated mail. The shift supervisor informed employees of the medical officer availability to discuss any concerns they had regarding irradiated mail. During the 4 hours that the medical officer was available at the facility, no employee came forward to be interviewed. A small group of employees asked questions concerning anthrax exposure and treatment during a work break. Of those employees that the medical officer spoke with while walking around the facility, all reported experiencing headache and lightheadedness during the first days when irradiated mail was delivered directly to the "V" Street facility and boxes containing irradiated mail were unpacked onsite. In addition, less than half of those spoken to stated they also experienced one or more of the following symptoms; eye irritation and tearing, nose irritation, chest and throat tightness. However, no employee reported experiencing symptoms such as headache, eye irritation, lightheadedness, nose irritation, chest and throat tightness, or nausea once the mail was unpacked and aired out at the Brentwood facility prior to being delivered to "V" Street.

The USPS occupational medicine physician stated that she visited the "V" Street facility between 30 November and 3 December 2001 to ascertain employee concerns. Over one shift she spoke with up to 33 employees who worked within the building and found that they were complaining of similar symptoms (headache, eye irritation, lightheadedness, nose irritation, chest and throat tightness, and nausea). Once it was determined that CO was being released into the "V" Street facility upon opening boxes of irradiated mail, the process was stopped. Employees working at the "V" Street facility were offered free medical evaluations looking for health problems related to exposure. A total of 92 employees submitted to the evaluations performed by the USPS occupational medicine service. Each evaluation consisted of a focused physical examination and blood tests for carboxyhemoglobin level and complete blood count. Of those employees who submitted to the evaluation none demonstrated a carboxyhemoglobin level above the expected normal level or above the level expected for an individual who smokes. None of the exposed employees at the "V" Street facility required emergency medical treatment or further medical treatment.

"V" Street employees stated they noticed an unpleasant odor associated with irradiated mail but did not associate any health effect to the odor. Several employees were observed wearing occlusive gloves (latex type) and N-95 half-face particulate respirators while sorting mail. Some of these employees were not consistently wearing the mask while performing work activities or when in the work area. It was also noted that employees did not attempt to fit the mask to their nose and face when first placing the mask on or when putting it back on after removal.

Conclusions

We sampled for contaminants including VOCs, O_3, CO_2, and CO, likely to be associated with heated mail as a result of the irradiation process. We also sampled for Cl_2 because it is an ingredient in cleaning solutions that may have been utilized at the Brentwood Postal Tent Facility or the "V" Street facility.

At the Brentwood Postal Tent facility, where the mail is first delivered from the irradiation process, all personal samples collected for CO and VOCs indicated concentrations below applicable exposure criteria. Area samples collected for CO in the middle of the trailer (when the trailer was full of mail) and inside the bags of mail indicated that there is a potential for worker CO exposures to exceed the NIOSH ceiling limit of 200 ppm, NIOSH REL of 35 ppm, OSHA PEL of 50 ppm, or ACGIH TLV of 25 ppm.

At the "V" Street mail processing facility all samples collected for CO and VOCs indicated concentrations well below applicable exposure criteria. **This indicates that the ventilating processes at the Brentwood Postal Tent Facility seem to be working.** CO_2 concentrations were also within acceptable occupational criteria. Inside the warehouse ("V" Street facility), CO_2 measurements were within recommended guidelines set by ASHRAE for indoor air environments (<1000 ppm).

Based on the findings of the USPS occupational medicine service there was no evidence of overexposure to CO among employees working in the "V" Street facility.

Recommendations

At the time of the NIOSH evaluation, measures had already been employed to help control potential exposures at the Brentwood Postal Tent Facility and reduce symptomatology at the "V" Street facility. Other measures which can be considered to further reduce potential exposure and protect employees include the following:

1. Continue with the "airing out" process of irradiated mail received at the Brentwood Postal Tent Facility. Another option for ventilating the mail would be to have the mail removed from plastic bags at the irradiation facilities and then transported to the Brentwood Postal Tent Facility in ventilated trailers. This would allow the mail to be ventilated during the transportation

process. If this is considered, monitoring procedures need to be in place at the irradiation facilities to ensure that workers are not over exposed to possible contaminants from the irradiation process.

2. Continue monitoring for CO and VOCs during the irradiated mail handling at the Brentwood Postal Tent Facility. When high peaks are found, investigate the task and area to see if a process change, handling procedure, or ventilation solution could alleviate the exposure.

3. Currently at the Brentwood Postal Tent Facility, the plastic bags of irradiated mail are opened in front of a temporary ventilation hood located inside the tent. This process should be continued.

During our evaluation, the ventilation hood had a capture velocity of approximately 50 - 100 feet per minute (fpm). The hood needs to generate an airflow pattern and capture velocity sufficient to control the motion of the contaminant-laden air plus extraneous air currents caused by cross drafts, vehicular traffic, etc.[15] During our evaluation, the ventilation hood was located in a tent and there were many extraneous air currents (i.e., fans, people traffic, open sides of the tent, vehicle traffic near the open areas of the tent, etc.) that may interfere with the hood's ability to capture contaminants released from opening the plastic bags containing irradiated mail. It may be necessary to increase the capture velocity of the hood to better control contaminants released from the plastic bags containing irradiated mail. One option that could be used to increase the capture velocities in front of the hood is to decrease the hood face area. This can be accomplished by attaching sturdy material to the top of the hood and hanging it a foot or so directly down (without hindering the workers' view and ability to perform the job safety). This will enclose the opening of the hood and should increase capture velocities. Another option to increase capture velocities is to enclose the operation more (i.e., enclosing the sides of the hood). This may reduce the possibility of CO peaks during the plastic bag opening process.

4. It is important for the USPS medical service to keep a log for tracking symptoms or problems employees experience related to handling or being exposed to irradiated mail. The log should be reviewed periodically by an occupational medicine physician to look for trends or areas requiring further evaluation.

5. We do not recommended that individuals wear gloves while handling irradiated mail. Individuals who choose to wear gloves while handling irradiated mail should first consider using a glove made of a breathable material known as a non-occlusive glove. The best non-occlusive glove to use is a thin cotton glove (other non-occlusive gloves with gripper pads on the palm and finger tip surfaces are also available). While not recommended, if an occlusive glove is used it should be a non-latex, powder-free glove of an appropriate size (latex gloves are not recommended because of the potential for developing an allergy to latex over time). Occlusive gloves (non-latex, powder-free gloves) should only be worn for short periods of time while handling mail and immediately removed when done to prevent excessive hand sweating and

irritation by the gloves. Cotton glove liners used underneath the non-latex, powder-free gloves can decrease occlusive glove irritation of the hands, and absorb perspiration. Gloves should be changed when they are grossly dirty or have perforations in them. Gloves should be removed when eating, drinking, or smoking.

7. Individuals who experience eye or nose dryness or irritation may use over-the-counter saline eye drops or saline nose spray as frequently as they feel necessary to alleviate symptoms.

8. If the eye or nose symptoms are not improved using these measures or if the individual experiences other symptoms on a continual basis while handling irradiated mail they should be evaluated by a physician.

Thank you for your cooperation with this investigation. This letter constitutes the final report of this HHE. For the purpose of informing affected employees, copies of this letter should be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days. If you have any questions, please do not hesitate to contact us at (513) 841-4387 (Ronald Hall) or (513) 841- 4463 (Dr. Jeffery Hess).

Sincerely yours,

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